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AUTHOR Graziadei, William D.; And Others
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ABSTRACT

The State University of New York (SUNY) established the need among faculty for an Internet-based course/classroom management system (CMS) to provide the means to customize and manage the instructional process in teaching and learning and to integrate the content from a variety of sources including instructors both local and remote, students, and publishers in an asynchronous or virtual learning and/or synchronous, distance learning environment. SUNY evaluated various commercial software applications to find a product which is open standards-based, easy to use and maintain, portable, replicable, scaleable, affordable, and has a high probability of success with long-term cost effectiveness. Other specifications included: the ability to get traditional face-to-face courses online in as short a period of time as possible in order to provide universal access to the content anywhere anytime and to do it in a simple but relatively seamless manner; and to reduce the amount of time spent teaching students to use the computer-based technology to keep the main focus on course content. The software programs TopClass and LearnLinc I-Net (LLI-Net) both interface well with several well-established Web-based support utilities. A complete course can be created, online, and running in as little as 4-6 weeks, and training needed for both faculty member and student can be conducted over the Internet and telephone. Either TopClass alone or a combination of TopClass and LLI-Net provide a comprehensive CMS package with low overhead for support. (Contains 15 references.) (Author/SWC)

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Building Asynchronous & Synchronous Teaching-Learning Environments: Exploring A Course/Classroom Management System Solution

ED 405 842

William D. Graziadei, Professor
bill.graziadei@plattsburgh.edu
SUNY Plattsburgh

Sharon Gallagher, Director
gallaghe@vax.cs.hscsyr.edu
SUNY Center For Professional Development In Technology

Ronald N. Brown, Director
brownrn@mail.suny.edu
SUNY Information Technology Exchange Center

Joseph Sasiadek, System Coordinator
sasiadjw@sysadm.suny.edu
SUNY Office of Educational Technology

State University of New York

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Abstract

There are a few commercially available instructional software applications for creating and managing Web-based asynchronous and/or synchronous course content. These software applications empower the learning community to create new teaching-learning environments. We are involved in a process of evaluating products and developing an overall strategy for technology-based course development and management in teaching-learning. The premise we work under is to explore as many products as possible until we find one that meets open standards, fits the circumstance(s) and works! The criteria for evaluating and adopting a possible solution(s) include: the product(s) must be open standards based (currently Web-based) that is easy to use and maintain, portable, replicable, scalable, affordable and has a high probability of success with a long-term cost effectiveness. One of our circumstances (WDG) was such that there was a need to get traditional face-to-face courses online in as short a period of time as possible in order to provide universal access to the content anywhere anytime and to do it in a simple but relatively seamless manner. In addition, in one of the courses approximately 40% of the time was spent teaching students the use of computer-based technology and there was(is) the desire to reduce this to 10% through the use of computer-based training (CBT) modules so that more time could be spent on the content. These same computer-based applications, e.g., CBT for Microsoft Office products, could also fulfill a similar need to train faculty and staff. We wanted a course management system that could integrate and deliver other course materials such as these off-the-shelf computer-based training modules as well as traditional course content. In summary, the questions being examined are: What's out there to do all this? Which one(s) do we use and why? What features do each have in comparison? What features should they have? What's the immediate and long-range costs? What and how long does it take for a faculty member to get a course online? What is the role of a synchronous learning (SL) environment within an asynchronous learning (AL) environment? We found that several well-established Web-based "support utilities", e.g., CUSeeMe, Timbuktu, Web forums and chat rooms, Seminar-On-Disk computer-based training modules, etc. interface nicely with the TopClass (formally WEST) and/or LLI-Net or Symposium software. A faculty member at one end of New York State can create and have online a complete course running at the other end of the State in as little as 4-6 weeks. The amount of training needed for the faculty member and student can be done via the Internet, Web and telephone. As simple as it seems either TopClass alone or the TopClass/LLI-Net combination is still a "comprehensive CMS" package with a low overhead for support.

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Introduction

The convergence of technology, telephony, computing and traditional educational pedagogy enables us to discuss, plan, create and implement fundamentally unique strategies for providing access to people and information through discovery. In the industrial age we went to schools; today, schools come to us [1, 2]. Over the next decade,

telecommunications technology will exert increasing influence over the ways in which learners learn and teachers teach [2]. Self-paced mediated instruction is making it possible for students to progress around content they already have mastered and dwell on that which is difficult for them. Distance learning is for continuous learning. The old paradigm of on-site versus distant learners is blurring [3]. One result of the mediation of information presentation is an increase in the similarity of experiences for traditional and distance learning students. Distance learning is becoming less of a novelty. Faculty-student contact time, whether in person or via telecommunications, is oriented toward interaction. As convergence and integration of multiple technologies such as telephone, computer and television occur, seat time will be a less important measure of instructional progress than possession of knowledge and skills. A learner centered model for institutions that serve students at various times in their lives with time and place independent credit instruction will flourish and blend with traditional education practice [2]. Higher Education needs to 'step outside of the box' and ask, "Is it necessary and efficacious that instructors meet students face-to-face' every session?" The answer to this question has broad implications for teaching and learning. In the end, the convergence connects teacher and teacher, teacher and student, student and student, and campus with library, dormitory, other universities, home, school, businesses, etc. in ways not previously possible and thus provides access to information and learning WHEN, WHERE, HOW and AS MUCH as the learner wants [2].

At many conference sessions and round table discussions on Teaching-Learning and Information Technology we often hear someone say, "...we need research, ... we need to prove, ...no one knows...,". Well, the fact is that a substantial body of educational research has been conducted on this subject. Studies of the influence of media on learning have been a fixed feature of educational research since 1912. These studies clearly suggest that media do not influence learning under any conditions. The best current evidence, is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition [4-7]. Does this mean that efforts to apply technology to the learning process are pointless? Not at all. We need to be clear about why we are doing so and what the associated benefits are, e.g., reducing costs or increasing access or both. Clearly, the choice of vehicle does influence the cost and/or extent of distributing instruction. Technology-aided, self-paced learning is a key element. Technology does not guarantee productivity; but coupled with changes in pedagogy, economies of scale, and a paradigm shift to individualized, self-paced mastery learning, technology can make greater learning productivity possible [8, 9]. In recent times universities have been called upon to make significant increases in the quality and quantity (larger classes), the call to "do more with less", of the educational experience without additional resources. Consequently, we have been exploring the use of the Web as Universal Interface together with course/classroom management software solutions as a means to enhance and extend the traditional classroom setting with possible later extension into the distance learning environment.

An important element of any virtual classroom (different time and different place) is asynchronous (inter)activity or activity done at the students' own time, place and pace. Just as important for any distance (same time but different place) or virtual classroom will

be synchronous (inter)activty in which students and instructors interact through live voice and video while working together with a synchronous collaborative software package such as LLinc I-Net or Symposium. The use of synchronous with asynchronous activities will be determined by the available technology, cost, maintenance and adjusted to suit each course, instructor and audience since synchronous components tend fix people in time and space because of the cost and the places where such technology is available. The more of the course that is conducted asynchronously, the more flexible and available the course is to the student, even from the kitchen table with relatively low cost and low-end computer, e.g., IBM-compatible Windows 486 or Quadra 660AV with 8 Megs of RAM and a 28.8 modem connection. A careful balance based on educational need will have to be determined. Finally, the "learning tools", whether used asynchronously or synchronously must communicate knowledge or skills to both face-to-face and distributed audiences with the highest likehood that the information will generate the desired results, i.e., participants achieve both higher and verifiable levels of content retention, undertanding and satisfaction with the learning process being employed.

Web course/classroom management (CMS) involves consideration of the educational process, effective CMS 'solution' product(s) and a strategy for deployment and training that will facilitate the creation and management of simple to sophisticated WWW-based asynchronous and synchronous teaching and learning environments. Two strategies can be adopted. One is to facilitate faculty in enhancing and extending their face-to-face traditional classroom instruction through the use of technology in a time-frame appropriate to the need and desire of the instructor. This can ultimately lead to the instructor later deciding to use the content in an asynchronous (virtual) and/or synchronous (distance) teaching-learning setting. The second approach is to facilitate faculty in getting their course completely online in as short a time as possible. In either case the course can be taught using technology via the traditional face-to-face mode, completely taught in a virtual and/or distance mode or using some mix of these two delivery modes. The modes for delivery of asynchronous and synchronous teaching-learning can be done using a centralized or distributed infrastructure approach. One can either choose to develop and use their 'own' Web-based CMS tool(s) and/or discover and adapt a commercially available one(s). A few robust commercial products are currently available and the market is evolving and growing rapidly. The premise we work under is to explore as many products as possible until we find one that meets open standards, fits the circumstance(s) and works! The criteria for evaluating and adopting possible solutions includes: the product(s) must be open standards based (currently Web-based) that is easy to use and maintain, portable, replicable, scalable, affordable and has a high probability of success with a long-term cost effectiveness. This generally requires working collaboratively with a company in order to adapt the product(s) to a given teaching-learning environment. We found WBT Systems' TopClass (formally Web Educational Support Tools - WEST) and/or ILINC's LearnLinc I-Net or Centra's Symposium with its java-based interface, which we are currently exploring, to be easy-to-use Web-based CMS tools for creating and managing asynchronous (virtual) and synchronous (distance) learning. During our CMS product exploration we also discovered that computer-based training modules called Seminar-On-A-Disk provided an approach to teach vital skills for today's most important PC/Mac applications thus saving on class time

and we could do it within the CMS.

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Four-Phase Exploration Approach Strategy

A four phase approach for coordinating technology-based CMS has been established from which we are proceeding to explore CMS. The four phases are: 1) Asynchronous Learning with CMS, 2) Asynchronous & Synchronous Learning with CMS and LearnLinc I-Net with Telephone Conference Calling, 3) Asynchronous & Synchronous Learning CMS and LearnLinc I-Net with Desktop Videoconferencing and 4) Asynchronous & Synchronous Learning CMS and LearnLinc I-Net with Desktop and/or Room Videoconferencing. The focus of the first phase was/is on management of asynchronous style courses since this is the least costly and requires minimal technology as compared to the other 3 phases. Current and subsequent phases, especially Phase 2 which only requires the addition of another telephone line and a telephone, are being explored with cognizance of the convergence of asynchronous and synchronous learning and the convergence and integration of multiple technologies. It should be noted that Phase 1 would generate the greatest possible number of participants followed by Phase 2, then Phase 3 and finally Phase 4; this is so since the same order dictates the type of technology required of a participant to enroll in a course, i.e., each phase begins to fix each participant more and more in time and to location and hardware/software. As a result we are currently only pursuing synchronous learning (Phase 2) as an option, e.g., office hours, extra help sessions, etc., in asynchronous learning.

What is needed is a specific set of standards that addresses the need to manage the teaching-learning process and provide a framework within which individual learning modules can be integrated and the classroom managed when synchronous teaching-learning is employed. Finally, a set of tools is required which enable instructors to create and manage course content and learners to access easily the Web-based instructional materials with a standard interface.

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What is a Course/Classroom Management System (CMS)?

The instructional process typically incorporates the following elements:

1. consider different teaching and learning styles
2. establish learning objectives
3. create, locate, track and review learning materials, e.g., diagnostic instruments, textbooks, learning modules, assessment instruments, mastery tests, etc.
4. register students and review/track students' progress and manage needed

interventions

5. provide student access to instructional components/modules
6. assign appropriate materials to students
7. manage student-instructor and student-student communications both asynchronously and synchronously (when desired/required)
8. evaluate student learning
9. evaluate course and instructor
10. report learning outcomes
11. reengineer/reorganize course content based on course evaluations
12. deliver the course again

In the traditional teaching environment, this process is designed, managed, and implemented by teachers. In today's networked environment, this process can be designed by teachers but managed by software, and may actually be shared among teachers, students, and other entities such as publishers and information providers. We are calling this computer-based, course/classroom management system a CMS.

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Need

There is a common need among faculty at SUNY campuses for an Internet-based course/classroom management system (CMS) to provide the means to customize and manage the instructional process in teaching and learning and to integrate the content from a variety of sources which include the instructors local and remote, students, publishers, etc. in an asynchronous or virtual learning (AL) and/or synchronous distance learning (SL) environment. It should be noted that SL can be employed as an option as required and/or desired and is independent of AL.

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Critical Issues:

In order to implement and sustain CMS with a high probability of success, we identified the following critical areas:

1. enhancing/extending learning and productivity in the face-to-face traditional classroom setting

2. creating a Web-presence with easy access to 'basic' information about online courses and interactive learning materials

3. discovering/developing tools and standards to support new learning environments

4. advancing our understanding of the virtual and distance university

5. increasing community/off-campus access to the teaching-learning community

6. providing evidence of the viability of these concepts

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CMS Criteria

The criteria we used in considering course management systems included:

- Web-based
- Open architecture (Wintel, Mac & UNIX)
- Modular toolset
- Scalable
- Support a centralized and/or distributed approach
- Easy to use (instructor & student)
- Easy to maintain (administrator)
- Easy to import and export materials
- Affordable
- High probability of success
- Long-term costs relatively low

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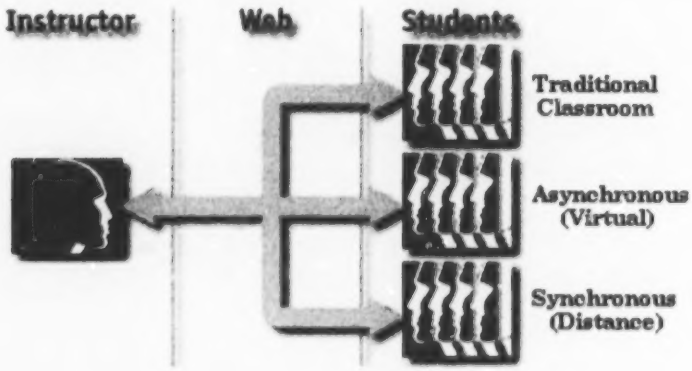
What is TopClass?

WBT Systems' TopClass is a tool that facilitates the creation and management of simple to sophisticated asynchronous World Wide Web-based educational environments. It can be used to create entire online courses or to simply publish materials that supplement existing courses. TopClass not only produces courses for the WWW, but also uses WWW browsers as the interface for the course-building environment. Aside from facilitating the organization of course material on the Web, TopClass also provides a wide variety of tools as well as access to other Web-based features that can be added to a course. Examples of tools/features include a conferencing system, online chat, screen sharing, student progress tracking, group project organization, student self-evaluation, grade maintenance and distribution, access control, navigation tools, auto- and instructor-corrected exams, electronic mail, and much more. Creation and inclusion of content into a course by an instructor involves using a favorite HTML editor or converter,

e.g., FrontPage, Internet Assistant, PageMill, Home Page, etc. to create the content or what is called in TopClass 'Unit Learning Module' which can be a syllabus, lecture, exercise, examination, etc. and then clicking on an 'Upload' button to move the material from a local disk to the TopClass server database. Then TopClass checks all links and even will allow the instructor to uplaod images in the file. Several other features such as batch registration, threaded discussion, etc. are also available.

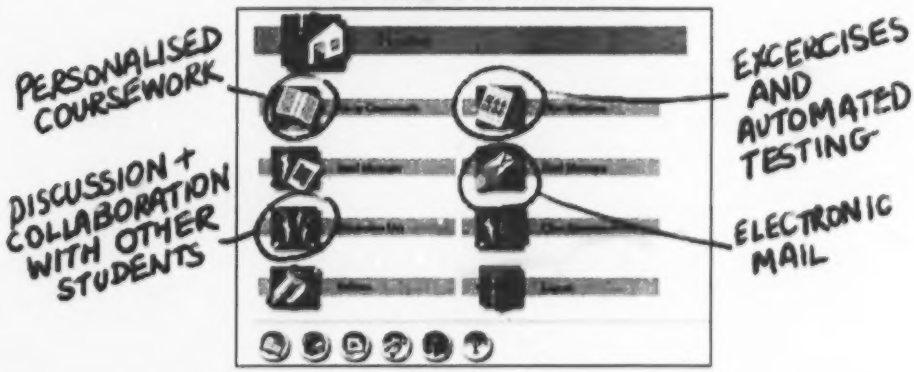
Course Management (CMS) With TopClass



TopClass Features

[Virtual Classroom] [Content Management] [Creating Course Content] [Student Management] [Tracking Students]

Virtual Classroom



TopClass connects students or learners with each other as well as their instructor in an integrated environment. Connectivity is web-based and runs over the internet or intranet. Access is by username and is password protected. The interface is intuitive. All users have access through a standard Web browser, on any platform. Central to learning is the ability for students to use the built-in messaging system and discussion forums.

Coursework is easily personalized for the individual student to provide more relevant and effective learning. Students communicate with their instructors and each other. The built-in e-mail system uses the same format as the discussion lists. This means users can create mailboxes in their Read Messages section and file their incoming mail in them. They can also preview messages before they send them and attach files.

[Virtual Classroom] [Content Management] [Creating Course Content] [Student Management] [Tracking Students]

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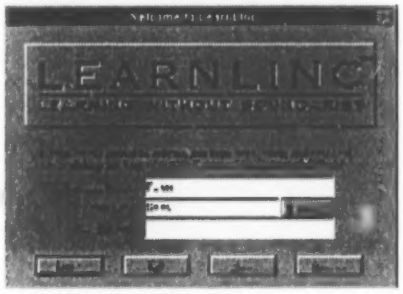
What is LearnLinc I-Net?

ILINC's LearnLinc I-Net (LLI-Net) are tools that facilitate a synchronous learning environment as well as provide for classroom management. LLINC is a distance learning solution that provides desktop videoconferencing, true application sharing, scalable class size, enhanced multimedia authoring tools and multimedia resource management tools. Instructors can lead students through Web content and multimedia courseware, solicit student input and verify student progress, all over the Internet in real time. I-Net offers the proven benefits of class coordination, interactive multimedia learning, and class administration over the Internet or Intranet (Web page synchronization). Students can receive interactive LearnLinc courseware from any computer with Internet access. With the addition of a conference telephone line or video conferencing link, the instructor can add even more interactivity to the classroom.

LearnLinc & I-Net Features

[Login] [System Manager] [Classroom Manager] [Synchronization] [Coursework] [Whiteboard] [Question & Answer]



LearnLinc and I-Net, software products of ILINC, have many of the features needed for 'classroom management' in a system. It is not the "swiss army knife" of CMS packages, but it is very well tuned for synchronous (distance) education needs. Because it is a computer software, one can expect it to naturally evolve as communications capabilities, CMS standards and multicasting develop. LearnLinc and I-Net has the potential to serve an unlimited number of users.

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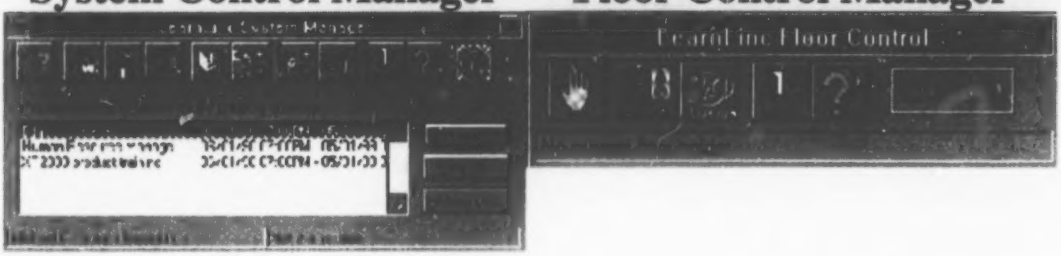
System Control Manager **Floor Control Manager**



The System Control Manager allows users to access session(s) they are enrolled in as well as accompanying course materials for either synchronous or asynchronous use.

The floor control manager allows the instructor to see a hand raised signal, recognize the participant and pass video, audio and floor control to them. The student merely clicks on the 'raised hand' icon to ask a question.

LLINC/I-NET are tools that facilitate a synchronous learning environment as well as provide for classroom management. LLINC is a distance learning solution that provides desktop videoconferencing, true application sharing, scalable class size, enhanced multimedia authoring tools, and multimedia resource management tools. Instructors can lead students through Web content and multimedia courseware, solicit student input, and verify student progress, all over the Internet in real time. I-Net offers the proven benefits of class coordination, interactive multimedia learning, and class administration over the Internet or Intranet (Web page synchronization). Students can receive interactive LearnLinc courseware from any computer with Internet access. With the addition of a conference telephone line or video conferencing link, the instructor can add even more interactivity to the classroom.

[Login] [System Manager] [Classroom Manager] [Synchronization] [Coursework] [Whiteboard] [Question & Answer]

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What is Seminar-On-Disk (SOD)?

InfoSource, Inc.'s computer-based training (CBT) modules called Seminar-On-A-Disk (SOD) is an approach to teach vital skills for today's most important PC/Mac computer operating systems (OS) and applications, e.g., word processor, spreadsheet, database and presentation programs. Best of all, the user does not need to have the application being learned installed on the computer. Seminar-On-A-Disk actually simulates the application. It precisely duplicates the screens and functions being learned so that when you work with the actual application, the look and feel remains the same as experienced with the particular SOD module. Just as the name implies, SOD is an interactive tutorial that can be used on any stand-alone (disk-based) computer or installed on a networked (LAN-based) and/or Web-based server to learn the most common and the most important PC/Mac application software packages in a simulated, self-paced, and fully-interactive environment. The users are guided through exercises that require them to complete functions exactly as they would when working in the actual application. The user enters

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data, formats and manipulates files and executes commands, .i.e., they learn by doing!

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SUNY CMS & SOD Demonstrations

During 1996 fall semester, three sessions of a technology demonstration titled, "Use of Web Educational Support Tools to Deliver Teaching, Training & Service" and one demonstration session titled, "Synchronous Teaching-Learning Environment" were held at different State Univeristy of New York (SUNY) locations. We have since had additional requests for these demonstration sessions from several other campuses and plan to hold at least four more sessions during the Spring 1997 semester.

The sessions included a demonstration of WEST (TopClass) , a Web-based course management system; SEMINAR-ON-A-DISK, self-paced training for microcomputer applications (Excel, WordPerfect, etc.); and a Web-based calendaring product. Those in attendance expressed the most interest in and need for the course management system (WEST). The following is a summary of the evaluations that we gathered concerning WEST at those events.

A total of 110 SUNY people and 12 non-SUNY people attended the demonstrations. Campus profile of attendees included 3 university centers, 2 health science centers, 6 four-year state university colleges, 3 colleges of technology, 9 community colleges and 1 statutory college.

Of that total, forty people from SUNY campuses completed the evaluation form. Ten of the forty indicated that they had decision-making (buying) authority for the campus they represented. Campuses represented in the evaluation pool included 2 university centers, 6 four-year state university colleges, 3 colleges of technology, and 6 community colleges.

The evaluation form asked two questions:

1. If you could put WEST on every computer on your campus regardless of platform, i.e., UNIX, Win '95 or Mac for $1,000 or less, would you be interested in buying this product?

2. Would you be interested in participating in a SUNY-wide contract/agreement to procure this product?

Of the forty people responding, 38 answered 'yes' to both questions including all 10 campus decision makers. Two members of a Distance Learning Commitee from one of SUNY's University Centers were very enthused about the product and asked us to get them an evaluation copy of the software.

Since the demonstrations, 10 guest accounts on the WEST development server that has been set up at SUNY Plattsburgh for people who want to evaluate WEST or show it to

others at the campus.

In addition, four faculty members indicated a need for WEST IMMEDIATELY to build and deliver courses for the Spring '97 semester. To accommodate these faculty and others that might be in a similar situation, an additional WEST/LLI-Net server has been established at SUNY Plattsburgh that will be dedicated to production, i.e., delivery of live AL/SL courses. A faculty member from SUNY Fredonia, a four-year state-operated campuses located in Western New York, attended one of our demonstration sessions during November 1996 and has since developed a course (Psychology of Music) from on the WEST server running at SUNY Plattsburgh in 8 weeks! His course went online January 22, 1997 and is being delivered to students at SUNY Fredonia, which is located in the southwest corner of New York State, from the server at SUNY Plattsburgh, which is located in the northeast corner of New York State.

Different librarian groups within SUNY commented that WEST provides a potential platform for quickly completing and implementing Web-based Information Literacy courses now being planned.

We were impressed with the flurry of interest and activity that occurred in a relatively short time. Positive comments about WEST focused on functionality, ease of use and affordability.

The audience at our demonstration session in Western New York seemed the most concerned about having a course management system that could integrate both synchronous and asynchronous tools. They seemed quite pleased that WEST had the functionality to integrate any type of application including synchronous tools like LLI-Net, CUSeeMe and Timbuktu.

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Hardware & Software Requirements

We considered the hardware and software requirements for faculty and students to fully utilize a course/classroom management systems like TopClass/LLI-Net and came up with these "toolsets" for each group.

Faculty Requirements

- Have to have
  - Wintel or Mac machine
  - Web Browser
  - Misc Utils, e.g. software to handle GIF and JPEG files, FTP, Timbuktu, CUSeeMe, Whiteboard
  - WordProcessor, e.g., Word or Wordperfect
  - Presentation program, e.g., Persuasion or Powerpoint

- Nice to have
  - Microsoft Office Suite of Products (or equivalent)
  - HTML Editor
  - Graphics Package, e.g., SuperPaint

Student Requirements

- Have to have
  - Wintel or Mac machine
  - Web Browser
  - Misc Utilities -- same as faculty

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Outcomes To-Date

From 1982 to 1993, we explored using the Internet, e.g., e-mail and conferencing, for computer-mediated communication in the teaching-learning environment to enhance and extend the traditional classroom experience and enable students to work collaboratively [2]. With the advent of the Web in late 1993 and its ability to deliver multimedia (text, image, sound and/or video) as well as its related Internet resources, e.g., chat, news groups, groupware, etc., we quickly migrated to using the Web and began implementing ideas for use in higher education pedagogy as part of a project called VICE in REST. This has led to our current interest in the implementation of Web-based virtual teaching using course/classroom management (CMS) software such as TopClass. This has allowed us to focus on issues of course (content) and classroom (human resource) management as we experience it in the face-to-face situation and beyond, i.e., break down the barriers and boundaries that impede instructor-student and student-student interaction.

By definition, "virtual education" is the study of credit and non-credit course content from world-wide remote sites that are not bound by physical location and/or time. A student can connect and interact with an instructor and other students in both real and virtual time. To-date little experimental evidence has been generated to demonstrate the effects of virtual versus traditional class format on student performance in the class and later in the work force. In addition, something more than 'just another transcript' is needed to properly evaluate students' work, e.g., online Career Portfolios. What has appeared is largely qualitative and/or anecdotal. What quantitative data do appear tend to be based on one time analysis of a single class or samples of two or more classes. Considering the amount of money being expended in higher education on infrastructure, software, training and technological pedagogy, what is needed is an 'ongoing analysis' with specific examples of students work to demonstrate the validity of the analysis. This section of the monograph is expected to be a 'Webolution'. So, check back often. We plan to continuously assess students from traditional classes taught face-to-face with and without the Web + CMS and compare them to students taking classes at a distance with the use of the Web + CMS. These conditions will be used to determine the degree to which traditional -/+ Web + CMS and virtual/distance Web + CMS teaching-learning impacts on the performance and

work of students during the course and later in the work force. We are in the process of assembling a questionnaire that we will mail to employers of students after graduation from SUNY Plattsburgh.

Course Information

Bio380 (Tele)Communicating Biology at the State University of New York (SUNY), Plattsburgh prior to 1994 was offered using only e-mail and VAX DEC Notes conferencing system. From the Fall 1994 semester to the present (Tele)Communicating Biology has been offered via the Web; this past Fall 1996 semester Bio380 was offered inder the TopClass umbrella. The enrollment in this course ranges from 12-15 students. In addition, during the Fall 1995 semester 17 students in an Immunology course were taught in a traditional classroom and this past Fall 1996 semester 15 students were met face-to-face twice per week and taught virtually on the World Wide Web using TopClass.

1. Bio380 (Tele)Communicating Biology Syllabus - William D. Graziadei, Ph.D. - Fall & Spring Semesters

    - Bio380 Online Course (Requires Username/Password)

        - Sample Lesson
            - How To Give A Seminar - The DOs & DON'Ts of Scientific Communication
        - Example of Student Work
            - Student Server - Student Home Pages

2. Bio407 Immunology Syllabus - Dr. William D. Graziadei, Ph.D. - Fall Semester

    - Bio407 Online Course (Requires Username/Password)

        - Sample Lesson
            - HIV, AIDS & Diagnosis
        - Example of Student Work
            - Cancer, Bone Marrow Transplant & Chemotherapy

Class notes (Unit Learning Modules), exercises, library resources/searches, examinations and course evaluations are made available for each course either on paper (prior to 1994) or electronically (1994 to present). At the end of each learning unit two type of examinations are administered - a short answer examination usually consisting of from 10-25 questions which is auto-corrected by TopClass and a problem-solving essay question(s) which is corrected and annotated by the instructor. Lastly, the CBT Seminar-On-A-Disk modules were used for instructing students in the Microsoft Office suite of applications. However, they were also available for students in Bio407 on a need basis.

As mentioned earlier, at many conference sessions and round table discussions on

Teaching-Learning and Information Technology we often hear someone say, "...we need research, ... we need to prove, ...no one knows...,". Students are assessed through the use of a pre-questionnaire asking, among other things, student demographics, attitudes/experience with computers and the specific discipline content. Post-assessment consists of student scores on the exams and midterm and final grades as well as information culled from the midterm and end-of-semester course evaluation questionnaire and student Web Career Portfolio. We present here some of our initial findings on ***Access & Attitudes*** and ***Content & Learning***.

Access & Attitudes. First, many of our students haven't yet heard about computer-mediated distance education. For most of today's students the whole idea is relatively new to them. As more and more online asynchronous Web-based courses become available and students are either required or become interested in the distance education option, the need to address access issues and the skills necessary for student success in learning at a distance is essential.

Case Study - Attitude & Access

Graphic & Data for Access & Attitudes Under Construction

Following the multiple choice section of the midterm and end-of-semester course evaluation, students were left ample room to reply to 5 questions:

1. What did you like least about this course?
2. What did you like most about this course?
3. If you had the opportunity to change one thing in this course immediately, what would that be?
4. What have you wanted to say that standard course evaluation forms didn't allow you to say about a (this) course.
5. Please add any comments you might have about TopClass. We are very interested in what you think needs improvement or how much you enjoyed using it etc. Please be as specific as possible.

Representative comments from some of the questions included in the pre- and post-course evaluation questionnaire:

□

Additional comments are provided for your convenience and use in the Interaction discussion forums and chat rooms. Select Bio380 (Tele)Communicating Biology or Bio407 Immunology Course Evaluation forums. When prompted for a username and password use **Interaction** to gain access. Feel free to also explore the other available forums and chat rooms. These provide additional opportunity outside of TopClass for student-student and student-instructor contact and collaboration. From the comments, it is important to advise prospective students considering credit or non-credit study using the

Internet. This form of learning may not be for everyone, at least not initially. Listed below are several key considerations that faculty and advisors may wish to consider [10].

1. Advise students not to be too quick to enroll in a full course of online study. They should first introduce themselves to the use of technology-based learning in a course that provides Internet access to content as an enhancement to learning and an extension of the face-to-face classroom.

2. Online asynchronous classes tend to circumvent scheduling problems by allowing learners to determine where and when they study and participate.

3. A big part of computer-mediated education is making the student more responsible (student-centered vs. instructor-centered) for self-learning. Instructors in the online environment interact and facilitate rather than lecture. This can sometimes leave a student, especially the first time user, in a situation where s/he has to find his or her own way. For some students this can have a significant effect on their performance.

4. Finally, one of the most important factors is a student's ability to navigate around the Internet. Knowing how to use a variety of search engines, database managers and do online searches using Boolean arguments to find the exact information that is sought is a prerequisite for most distance-delivered courses. Then when information is obtained to have some way in which to verify its authenticity and validity in terms of content and source. Clearly, some type of information literacy course needs to be implemented as a basic learning skill. Familiarity with the World Wide Web, gopher, newsgroups, ftp, telnet and e-mail for research and study are all part of necessary tools a student should possess.

Content & Learning. The courses at many of our universities around the world can be an intimidating experience for the new student. It is not only the difficulty of the material, but also the experience of sitting in any non-interactive lecture (small or large). The TopClass Desktop Education Server is designed to manage the delivery and support of training and education over the Internet and Intranet using the World Wide Web. TopClass uses a Web server to deliver course content and assessments over the Web. Indeed, it has transformed the Web to be "a classroom sans walls" [12]. Some of the many features of TopClass include e-mail, discussion lists, Web-based delivery of course content and automated or instructor corrected exercises. The exercise can be in multiple choice, short answer format and/or essay, can be randomized so each student gets a different set of questions and can be scored automatically by the Web server as soon as the student submits his or her answers or sent back by the instructor with a grade and annotation where appropriate. Student exercises can be configured to automatically assign extra study units or additional exercises if the student scores below preset threshold values. In addition, the instructor can be notified if a student does very well, very poorly or simply takes the quiz. Creation and inclusion of content into a course by an instructor involves using a favorite HTML editor or converter, e.g., FrontPage, Internet Assistant, PageMill, Home Page, etc. to create the content or what is called in TopClass 'Unit Learning Module' which can be a syllabus, lecture, exercise, examination, etc. and then

clicking on an 'Upload' button to move the material from a local disk to the TopClass server database. Then TopClass checks all links and even will allow the instructor to upload images in the file. Several other features such as batch registration, threaded discussion, etc. are also available.

Case Study - Content & Learning

Graphic & Data for Content & Learning Under Construction

Student Learning

The chart correlating short answer test scores and problem solving test scores to TopClass usage shows a very strong correlation between use of Web + CMS and a better undertanding of the information in the course.

It is extremely difficult to assess the accuracy of either of these results given the usually large variability students of Bio380 and Bio407 from one semester to the next. It is worth noting that final grade point average for all the students in the Bio407 Immunology Fall 1995 course (17 students with 1 failure) was 2.29 (with failure) and 2.43 (without failure) whereas the final GPA in the TopClass section of the course this past fall (15 students) was 2.61, but we remain uncertain as to the statistical significance of this number. The most significant finding was that students using TopClass out performed students not using the Web + CMS on problem solving questions. Performance on short answer examinations was about the same. We will continue to track the performance in this course each semester in order to see if there is a significant difference. Finally, the time spent teaching technology (Microsoft Office suite of applications) was reduced to less than 10% as a result of using the computer-based training SODs in Bio380. The students needing the instruction were pleased to be able to do these simulations at their own pace even though they were initially assigned to work in pairs which they said helped a great deal as well. Those who didn't need this type of assistance appreciated not having to review what they already knew.

Clearly, universal access strategies must be put in place for anyone to learn anytime anyplace. With TopClass, a student can log into his or her classroom at a desk at any given moment whether in a car, train or plane or at home at the kitchen table or in the dormitory at a desk. These data indicate that technology can influence student achievement; however, whether it influences learning will have to await the outcomes of these students in the work force 5 and 10 years from now!

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Conclusion

No two learners learn from the same presentation in the same way or as well. No two instructors use the same medium in the same way or as well. No two lessons are suited for

delivery by the same style or through the same medium [1]. The task an instructor faces when considering what pedagogy to use in instruction should include a process that is diagnostic in nature, i.e., one where we ask ourselves which channels are appropriate for which communication and teaching-learning style. We need to teach how we came to know what we know and not merely what we know [2]. Technology can empower us to do more of this. Technology is NOT a deterministic force; it is a tool to put in the hands of decision makers - adminsitrators, instructors and students. However, we must be constantly on alert not to place so 'high an expectation' on technology to correct today's educational problems that we are disappointed at the results in the long run [13-15].

It has been widely documented that the ability to originate and receive telecommunications will become more and more common [3]. Computing and two-way audio/video, e.g., desktop videoconferencing, screen and application synchronization/sharing, etc., will be available to almost everyone in universities/colleges, schools, homes and in the workspace, as telephones are now. Convergence and multimedia integration, that is the blending of telephone, computer and television capabilities in one application will allow people to interact in combinations of voice, text and video in real time or delayed. The World Wide Web and its sundry browsers provides the universal interface needed for such interactivity.

The capabilities made possible by convergence and integration of multiple technologies will include access to instruction, entertainment and other information sources such as cable television. They also will offer interactive information service in voice, text, video and multimedia formats, e.g., Microsoft NBC and PointCast, as well as a range of interactive consumer services handling shopping, banking, library, professional services, and no doubt, for credit educational programming. Some of these information, education and consumer services will involve interaction with other people, while many will involve interaction with pre-produced video, audio and text programs. Search Engines, that is, services that guide individuals to information they desire, will become better at providing information that is more useful to both the teacher and learner. Since the sequence of information acquisition can be determined by the user and such information is in the 'public domain', they will have to learn to discriminate 'good' from 'poor' information until such time that 'validated' or 'refereed' mechanisms are in place. Until then, media production quality will range from extremely high for programming produced by major entertainment and educational services.

An important element of any virtual classroom (different time and different place) is asynchronous (inter)activity or activity done at the students' own time, place and pace. Just as important for any distance (same time but different place) or virtual classroom will be synchronous (inter)activty in which students and instructors interact through live voice and video while working together with a synchronous collaborative software package such as LLinc I-Net or Symposium. The use of synchronous with asynchronous activities will be determined by the available technology, cost, maintenance and adjusted to suit each course, instructor and audience since synchronous components tend to fix people in time and space because of the cost and the places where such technology is available. The more of the course that is conducted asynchronously, the more flexible and available the

course is to the student, even from the kitchen table with relatively low cost and low-end computer, e.g., IBM-compatible Windows 486 or Quadra 660AV with 8 Megs of RAM and a 28.8 modem connection. A careful balance based on educational need will have to be determined. Finally, the "learning tools", whether used asynchronously or synchronously must communicate knowledge or skills to both face-to-face and distributed audiences with the highest likehood that the information will generate the desired results, i.e., participants achieve both higher and verifiable levels of content retention, undertanding and satisfaction with the learning process being employed.

TopClass and/or LLINC I-Net are tools that facilitate the creation and management of simple to sophisticated asynchronous and synchronous World Wide Web-based teaching-learning environments. Together or alone each can be easily and quickly used to create an entire online course, or to simply publish materials that supplement existing courses and/or facilitate users training and experience with computer operating systems (OS) and software applications. TopClass and LLINC I-Net not only produce courses for the WWW, but also use Web browsers as the interface for the course-building and classroom-management environment.

Aside from facilitating the organization of course material on the Web, TopClass and LLI-Net also provide a wide variety of tools as well as access to other Web features that can be integrated into a course. Examples of tools/features include a conferencing system, online chat, screen sharing, student progress tracking, group project organization, student self-evaluation, grade maintenance and distribution, access control, navigation tools, auto- and instructor-corrected exams, electronic mail, and much more. For example, several well-established Web-based "support utilities", e.g., CUSeeMe, Timbuktu, Web forums and chat rooms, Seminar-On-Disk computer-based training modules, etc. interface nicely with the TopClass and/or LLI-Net software.

It is fairly easy and straightforward for an instructor to create course content anywhere anytime . A faculty member at one end of New York State can create and have online a complete course running at the other end of the State in as little as 4-6 weeks. The amount of training needed for the faculty member and student can be done via the Internet, Web and telephone. As simple as it seems either TopClass alone or the TopClass/LLI-Net combination is still a "comprehensive CMS" package with a low overhead for support. Very importantly these products keep an eye on the future with a cognizance of the convergence of asynchronous and synchronous learning and the convergence and integration of multiple technologies. Finally, working with WBT Systems., ILINC and InfoSource, Inc. has been a truly synergistic relationship between the academic and commercial sectors. Our experiences with them in general and its developers in particular have been both positive and collaborative! They are 'immediately' responsive when we need(ed) support and most importantly they listen to suggestions about product functionality in the teaching-learning environment! These are the reasons why these products 'fit' our situation.

Overall, TopClass had a significant and positive impact on the students in both Bio380 and Bio407. The students enjoyed using the system for access to unit learning materials,

exams, problems, e-mail and discussion groups. There appears to be an initial positive correlation between the use of TopClass and exams and final grade scores. While some of this is undoubtedly due to self-selection, most student comments clearly indicate that they overwhelmingly believe that TopClass helped them to improve their performance and quality of work, but most of all that they 'enjoyed' learning and interacting in this manner! The students who used TopClass were much more enthusiastic about the course and the material covered than if they had not been offered this Web-based CMS teaching-learning resource.

It is therefore our recommendation that the use of TopClass throughout SUNY be expanded slowly to help faculty get started 'now' and to examine the issues of access and efficacy. The most logical route is to use TopClass as an option for courses in the immediate future and proceed from there if successful and the instructor so chooses.

On the basis of faculty and student replies, we recommended that the University pursue site licensing of TopClass and hold workshops to instruct faculty members in its use and to provide support thereafter. However, we also need to point out a few major shortcomings in the software that be addressed:

1. There is currently no way to delete an existing list of students and passwords. Each must be deleted by hand; for a 1,000 person course this is simply unmanageable.
2. There is currently no way to export a list of student scores for each exercise or set of exercises. This limits the use of TopClass to self-study quizzing only.
3. There is currently no way to move a unit learning module from one ULM to another.

These short comings aside, TopClass has significant potential to make a positive impact on the learning experience of undergraduate and graduate students throughout SUNY and beyond. The use of TopClass should be expanded immediately and a follow-up study performed to determine the efficacy of this teaching resource versus other alternatives.

The availability and integration of interactive technologies will stimulate the development of new materials and services and the 'Webolution' will continue. The convergence of technologies that connects teacher to teacher, teacher to student, student to student, and campus with library, dormitory, other universities, home, schools, businesses, etc. in ways not previously possible will continue to nurture existing pedagogical and learning styles while spawning both teacher and learner to revisit 'old' and 'new' avenues for us to teach and learn. Realizing the promise of these technologies will take creativity, vision and the courage to try and change our ways of doing what we do as well as our willingness to re-engineer the 'traditional classroom meeting place' and a deep understanding of the way we teach, learn, gather, retain, and understand information. For our part we will continue to ask whether what we do is educationally sound! In addition, we commit with others to continually examine the forces manadating change, exploring the technologies faciltating change and illuminating the choices and challenges that we all face in navigating toward the networked collaborative educational environments of "Continuous Education" [3].

One can easily find the right CMS software package or online program/course within a

specific discipline - thanks to Internet search engines like Lycos, Yahoo, Excite, Alta Vista, Metacrawler, etc. Anyone interested in discovering more about CMS and distance education can do so by simply typing into Web forms keywords such as "Course Management", Classroom Management", "Asynchronous Courses", Synchronous Courses", "Distance Edcuation", "Virtual Universites or Classrooms", "Continuing Education", "Online Courses", "Online Distance Education", etc. The CASO Guide, Education & Courses, SUNY Virtual Classrooms, Virtual Classroom, World Lecture Hall, etc. are examples of just such a search. These Web pages are designed so that users can easily choose courses anywhere anytime and span a broad range of degrees (BA/BS, MA/MS and PhD), disciplines, programs and courses. A shift in the teaching-learning paradigm is steadily evolving as technology in the classroom becomes more readily accessible. Students are becoming more responsible for discovery, problem-solving, contributing and self-learning while we as instructors serve to guide them in the process by which we came to know what we know. Finally, providing good educational experiences is obviously superior to providing poor ones, whether that be face-to-face or online; but; still this does not lead directly to increased learning. However, we must always be be cognizant of and take into account that there are many ways that students learn, such as reading, problem solving, discussion with other students, discussion in the recitations, performing laboratories, and so on. Consequently, a judicious use of technology that provides for these avenues may very well be warranted. The availability and integration of interactive technologies will stimulate the development of new materials and services and the 'Webolution' will continue. The convergence of technologies that connects teacher to teacher, teacher to student, student to student, and campus with library, dormitory, other universities, home, schools, businesses, etc. in ways not previously possible will continue to nurture existing pedagogical and learning styles while spawning both teacher and learner to revisit 'old' and 'new' avenues for us to teach and learn.

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William D. Graziadei, Webmaster
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